Soprotivleniye materialov (dlya tekhnikumov) izd. 4-e, perer. AID 663 - I

of bending, Zhuravskiy's formula, combined bending and torsion, Buckling, strength under dynamic and variable loads, and fatigue of metals. The book is provided with many practical problems and their solutions, also with a 'controlling' questioner after each of the 14 chapters.

No. of References: None

Facilities: None

KINASOSHVILI, R.S.

ANDREYEV, L.Ye., kandidat tekhnicheskikh nauk; BIDERMAN, V.L., kandidat tekhnicheskikh nauk; BOYARSHINOV, S.V., kandidat tekhnicheskikh nauk; VOL'MIR, A.S., doktor tekhnicheskikh nauk; DIMENTBERG, F.M. kandidat tekhnicheskikh nauk; ZASKLATELEV, S.M., inzhener; KINASOSHVILI, R.S., doktor tekhnicheskikh nauk, professor; KOVALENKO, A.D.,; MAKUSHIN, V.M., kandidat tekhnicheskikh nauk MALININ, N.N., kandidat tekhnicheskikh nauk; PONOMAREV, S.D., doktor tekhnicheskikh nauk; PRIGOROVSKIY, N.I., doktor tekhnicheskikh nauk; TETEL'BAUM, I.M., kandidat tekhnicheskikh nauk; UMANSKIY, A.A., doktor tekhnicheskikh nauk, professor; FEODOS'YEV, V.I., doktor tekhnicheskikh nauk; SERENSEN, S.V., redaktor; TRAPEZIN, I.I., kandidat tekhnicheskikh nauk, redaktor; KARGANOV, V.G., inzhener, redaktor; SOKOLOVA, T.F., tekhnicheskiy redaktor.

[Mechanical engineer's manual; in 6 volumes] Spravochnik mashinostroitelia; v shesti tomakh. Izd.2-e, ispr. i dop. Moskva, Gos. nauchno-tekhn.izd-vo mashinostroit. lit-ry, Vol.3, 1955. 563 p.
(Mechanical engineering) (MLRA 8:12)

KIMASOSHVILI, R.S.

Comments on M.Z.Naredetskii's two papers: "Extension of a square plate weakened by a circular hole at its center" and "Stresses in high-speed bearing cages." Izv.AN SSSR.Otd.tekh.nauk no.8:159-161 Ag '55. (MLRA 9:1)
(Elastic plates and shells) (Bearings (Machinery))

AL'SHITS, I.Ya., kandidat tekhnicheskikh nauk; BABKIN, S.I., kandidat tekhnicheskikh nauk; BALAKSHIN, B.S., doktor tekhnicheskikh nauk, professor; BEYSEL'MAN, R.D., inzhener; BELYAYEV, V.N., kandidat tekhnicheskikh nauk; BEREZINA, N.I., inzhener; BIRGER, I.A., doktor tekhnicheskikh nauk; BOGUSLAVSKIY, Yu.M., kandidat tekhnicheskikh nauk; BOROVICH, L.S., kandidat tekhnicheskikh nauk; GONIKBERG, Yu.M., inzhener; GORDON, V.O., professor; GORODETSKIY, I. Ye., doktor tekhnicheskikh nauk, professor; GROMAN, M.B., inzhener; DIKER, Ya.I., kandidat tekhnicheskikh nauk; DOSCHATOV, V.V., inzhener; IVANOV, A.G., kandidat tekhnicheskikh nauk; KINASOSHVILI, R.S., doktor tekhnicheskikh nauk, professor; KRUTIKOV, I.P., kandidat tekhnicheskikh nauk; LEVENSON, Ye.M., inzhener; MAZYRIN, I.V. inzhener; MARTYNOV, A.D., kandidat tekhnicheskikh nauk; NIBERG, N.Ya., kandidat tekhnicheskikh nauk; NIKOLAYEV, G.A., doktor tekhnicheskikh nauk, professor; PETRUSEVICH, A.I., doktor tekhnicheskikh nauk; POZDNYAKOV, S.N., dotsent; PONOMAREV, S.D., doktor tekhnicheskikh nauk, professor; PRONIN, B.A. kandidat tekhnicheskikh nauk; RESHETOV, D.N., doktor tekhnicheskikh nauk, professor; SATEL', E.A., doktor tekhnicheskikh nauk, professor; SIMAKOV, F.F., kandidat tekhnicheskikh nauk; SLOBODKIN, M.S., inzhener; SPITSYN, N.A., doktor tekhnicheskikh nauk, professor; STOLBIN, G.B., kandidat tekhnicheskikh nauk; TAYTS, B.A., doktor tekhnicheskikh nauk; CHERNYSHEV, N.A., kandidat tekhnicheskikh nauk; SHNEYDEROVICH, R.M., kandidat tekhni-

(Continued on next card)

AL'SHITS, I.Ya., kandidat tekhnicheskikh nauk (and others)....... Card 2.

cheskikh nauk, EYDINOV, V.Ya., kandidat tekhnicheskikh nauk; ERLIKH, L.B., kandidat tekhnicheskikh nauk; ACHERKAN, N.S., doktor tekhnicheskikh nauk, professor, redaktor; MARKUS, M.Ye., inzhener, redaktor; KARGANOV, V.G., inzhener, redaktor; SOKOLOVA, T.F., tekhnicheskiy redaktor.

[Mechanical engineer's manual; in 6 volumes] Spravochnik mashinostroitelia; v shesti tomakh. Izd.2-e, ispr. i dop. Moskva, Gos. nauchno-tekhn.izd-vo mashinostroit. lit-ry, Vol.4, 1955. 851 p.
(Mechanical engineering) (MLRA 8:12)

AUTHOR: Kinasoshvili, R. S. (Moscow) SOV/179-59-3-17/45

TITLE: Determination of a Reserve of Elasticity at Non-stationary Temperature and Tension (Opredeleniye zapasov prochnosti pri nestatsionarnoy temperature i nestatsionarnoy napryazhennosti)

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Mekhanika i mashinostroyeniye, 1959, Nr 3, pp 126-128 (USSR)

ABSTRACT: A method is described where the reserve of elasticity is determined for the conditions of unstable loading and heating. The following characteristics of the material are investigated: the tension σ, temperature t and the duration T or the number of cycles N. The relationship is defined by Eq (1) and illustrated in Fig 1, where a - elasticity and b - stability. It can be seen that both kinds of curves are similar and, therefore, both the elasticity and stability can be investigated simultaneously. As an example, two sets of parameters σ_1, t_1, T_1 and σ_2, t_2, T_2 are illustrated in Fig 2. The value T_3 for

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SOV/179-59-3-17/45

Determination of a Reserve of Elasticity at Non-stationary Temperature and Tension

elasticity only is found from the formulae

$$K_1 = \sigma_1'/\sigma_1$$

or $$\sigma_3' = \sigma_2 K_1 .$$

The time T_3 is determined from the graph, Fig 2, then the total time $T_c = T_2 + T_3$ is found from the curve corresponding to t_2 and the value of σ_ℓ is thus determined. Next, the reserve of elasticity is determined from the formula

$$K = \sigma_\ell/\sigma_2 .$$

If the curves are not available , then the formulae (2) and (3) can be used, where the indices m and n and the constants a and b should be known. The material can be subjected to an endurance test when the magnitude of a in the expression (4) is evaluated by experimental means (T_1, ..., T_S and N_1, ... N_S - duration of experiments,

Card 2/3

Determination of a Reserve of Elasticity at Non-stationary Temperature and Tension

T_1^x, ... T_s^x and N_1^x, .. N_S^x - time or number of cycles required for disintegration). Usually a is equal to one but a $>$ 1 when the material is subjected to a hardening process; a $<$ 1 for a more intense test. Figs 3-6 illustrate the experimental (continuous lines) and calculated (dashed lines) results. The accuracy of calculation was 10%.
There are 6 figures.

SUBMITTED: March 4, 1959

KINASOSHVILI, Robert Semenovich; SNITKO, I.K., red.; AKHLAMOV, S.N., tekhn.red.

[Resistance of materials; brief manual] Soprotivlenie materialov; kratkii uchebnik. Izd.6., perer. Moskva, Gos.izd-vo fiziko-matem. lit-ry, 1960. 387 p. (MIRA 13:9)
(Strength of materials)

KINASOSHVILI, R.S., prof.; TALAKVADZE, V.V., inzh.; PONOMAREV, ~~N.N.;~~ inzh.

Letters to the editor. Vest.mash. 40 no.7:36-37 Jl '60. (MIRA 13:7)

(Mechanical engineering)
(Mechanical drawing)

ACCESSION NR: AT3012270 S/2572/63/000/009/0327/0338

AUTHOR: Kinasoshvili, R. S., (Doctor of technical sciences, professor)

TITLE: Determining the safety factors under unsteady variations of alternating

SOURCE: Raschety* na prochnost'; teoreticheskiye i eksperimental'ny*ye issledovaniya prochnosti mashinostroitel'ny*kh konstruktsiy. Sbornik statey, no. 9, 1963, 327-338

TOPIC TAGS: safety factor, alternating stress, unsteady stress variation

ABSTRACT: The author is concerned with refining the methods for determing endurance factors and equivalent loads for nonstationary variable stresses. He first treats changing of axisymmetric stress cycles to equivalent symmetric ones and studies endurance under stationary loading. Then he determines the endurance factor under nonstationary loading and finally discusses equivalent stresses. The results obtained in a program of testing materials show that, depending on the properties and the stress plan, both strengthening and weakening of the material are observed. Orig. art. has: 19 formulas and 6 figures.

ACCESSION NR: AT3012270

ASSOCIATION: none

SUBMITTED: 00 DATE ACQ: 15Nov63 ENCL: 00

SUB CODE: AP NO REF SOV: 007 OTHER: 000

Card 2/2

KINASOSHVILI, R.S., doktor tekhn. nauk, prof. [deceased]

Determining strength potential for the general case of nonstationary conditions of the work of a part. Vest. mashinostr. 44 no.6:32-34 Je '64. (MIRA 17:8)

BIRGER, I.A., red.; DAREVSKIY, V.M.; KINASOSHVILI, R.S.; SERENSEN, S.V., red.; SHORR, B.F., red.; RODZEVICH, S.S., red.

[Stability and dynamics of aircraft engines] Prochnost' i dinamika aviatsionnykh dvigatelei; sbornik statei. Moskva, Mashinostroenie. No.1. 1964. 287 p. (MIRA 18:10)

KINASTOWSKI, S.

A few words on research methods and results in experimentation. p. 70.

SYLWAN. (Wydzial Nauk Rolniczych i Lesnych Polskiej Akademii Nauk i Polskie Towarzystwo Lesne) Warszawa, Poland Vol. 101, no. 8, Aug. 1957

Monthly list of East European Accessions Index (EEAI), LC, Vol. 8, no. 6, June 1959
uncla.

APPROVED FOR RELEASE: 06/13/2000 CIA-RDP86-00513R000722530006-6"

KINASTOWSKI, S.

The influence of tapping upon physical and mechanical properties of Scotch pine wood; a preliminary report. P. 31.

SYLWAN. (Wydzial Nauk Rolniczych i Lesnych Polskiej Akademii Nauk i Polskie Towarzystwo Lesne) Warszawa, Poland. Vol. 103, no. 6/7, June/July 1959.

Monthly List of East European Accessions (EEAI) LC, Vol. 9, no. 1, Jan. 1960.

Uncl.

DUDZIK, Z.; KINASTOWSKI, S.

Catalysts containing free radicals. Pt.1. Bul Chim PAN 11 no.6:321-324 '63.

1. Department of Organic Chemistry, A.Mickiewicz University, Poznan. Presented by J.Suszko.

KINASTOWSKI, W.; KUZNICKI, L.; GREBECKI, A.

Some observations on the ecology of larvae of Molanna angustata (Curtis) and their distribution in an environment.

p. 191
Vol. 2, no. 1, 1954
POLSKIE ARCHIWUM HYDROBIOLOGII
Warszawa

SO: Monthly List of East European Accessions (EEAL), LC, Vol. 5, no. 12
December 1956

GREBECKI, A.; KINASTOWSKI, W.; KUZNICKI, L.

So-called peripheral reaction of Paramecium caudatum. Fol.biol. Warsz. 3 no.2:117-125 1955.

1. Zaklad Biologii Ogolnej Instytutu im. M. Nenckiego PAN. Kierownik: Prof. Dr. J. Dembowski.

(CILIATA,
Paramecium caudatum, affinity to peripheral spaces in closed areas)

(BEHAVIOR,
affinity of animals including Paramecium caudatum to peripheral spaces in closed areas)

KINASTOWSKI, W.

Report on the Session of the Enlarged Presidium of the Committee on Regeneration, December 8, 1958. Zesz probl nauki pol no.18:107 pt.2 '59.

*

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KINBER, B. Ye.

CARD 1 / 2 PA - 1810

SUBJECT USSR / PHYSICS
AUTHOR KINBER, B.E.
TITLE The Ratio between the Receiving and the Dispersing Energy in Receiving Antennae.
PERIODICAL Radiotechnika, 11, fasc.12, 53-54 (1956)
Issued: 1 / 1957

In the course of the present work a quantitative evaluation of the ratio of current received and dispersed by a receiving antenna is carried out on the basis of the known characteristic features of the antenna, the surface, and the useful coefficient of the "free" surface. This evaluation can be carried out both for a flat and for a space antenna. The author bases on the law of the conservation of energy and obtains the following equation:

$$\frac{P_{dispers.}}{P_{rec.}} = \frac{2-\mu}{\mu}$$

in which P denotes the received and dispersed output and μ the coefficient of the utilization of the free surface. On the occasion of the impinging of a flat wave with a constant amplitude upon the antenna the maximum of the relation of the received and of the dispersing energy currents cannot exceed ONE (i.e. $\mu \leq 1$), i.e. the dispersed output is in all cases greater than the received output. It must, however, not be assumed that this holds good in all cases. It is possible to show that, on the occasion of the impinging

Radiotechnika, fasc.12, 53-54 (1956) CARD 2 / 2 PA - 1810

of waves of a complicated structure upon the antenna, the received output may be greater than that dispersed by the antenna. The above evaluation applies only to the integral dispersion cross section of the antenna.

INSTITUTION:

KIMBER, B. E. and SOLOVEY, L. G.

"Distribution Function of Field Fluctuation in a Shadow."

Paper presented at the 4th All-Union Conf. on Acoustics, Moscow, 26 May - 2 Jun 58.

KINBER, B. E.

B. E. KINBER, E. T. Sharuyeva, A. I. Medvedev: "Investigation of two-mirror antennas with increased gain." Scientific Session Devoted to "Radio Day", May 1958, Trudrezervizdat, Moscow, 9 Sep. 58

A method has been developed to design two-mirror antennas which form a plane wave with constant amplitude after reflection from a large mirror. Peculiarities of the computation of the correspondence between the rays of the primary and reflected field are analyzed for the case when the contour of the exit aperture has angular points. The possibility is remarked of an affine transformation of ray bunches which would satisfy the energy balance. A method is analyzed of computing the mirror cross section and results are presented of a computation of an axisymmetric mirror with a remote emmitter. A preliminary experimental confirmation has been made of the dependence of the pattern parameters on the mutual location of the large and small mirrors and of the emitter.

KINBER, B. E.

B. E. KINBER, A. M. Model: "Cross-polarization characteristic of mirror antennas." Scientific Session Devoted to "Radio Day", May 1958, Trudrezervizdat, Moscow, 9 Sep. 58

Emission created by a linearly polarized source located at a mirror focus does not retain its polarization plane. The polarization of emission for an arbitrary axisymmetric mirror antenna excited by a source whose dipole moment is perpendicular to the mirror axis is analyzed. The cross-polarization pattern for sharply focussed antennas is one-half the difference of the pattern over the principal polarization component in the E and H planes. The relative portion of the energy incident is cross-polarization emission is calculated.

KINBER, B. YE.

108-13-5-4/11

AUTHOR: Kinber, B. Ye.

TITLE: On a Method of Successive Approximation in the Theory of Specially-Shaped Mirrors (Ob odnom metode posledovatel'nykh priblizheniy v teorii zerkal spetsial'noy formy)

PERIODICAL: Radiotekhnika, 1958, Vol. 13, Nr 5, pp. 31-39 (USSR)

ABSTRACT: The directivity diagram of the dispersion mirrors here is represented as a sum of diagrams which correspond to geometrical optics and of the diffraction diagrams. The resulting diagram has, because of the phase difference of these components, a slightly rugged character. In the 1st part the analysis of the diffraction corrections is given and in the 2nd part the method of the solution itself and a number of considerations concerning its application to a number of problems. The equation for the correction of the shape of the mirror is obtained. By means of this equation the mirror shape can be defined exactly by computation and experiment, and the approximations for the given directivity diagram can be ameliorated. The

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108-13-5-4/11

On a Method of Successive Approximation in the Theory of Specially-Shaped Mirrors

results of an experimental control of the correction equation are given. Summarizingly it is stated: 1) The low ruggedness of the diagram of special shape of the type of a cosecant diagram is interpreted as an effect which is connected with the influence of the mirror end measures and which occurs as the result of the superposition of the side-branches upon the basic field (which is computed according to the laws of geometrical optics). 2) For the application of the correction equation the computation- as well as the experimental diagram of the directivity of the mirror which is to be corrected can be used. The correction equation is appliable for cylindrical mirrors as well as for mirrors with double curvature. There are 9 figures and 9 references, 6 of which are Soviet.

SUBMITTED: April 11, 1957

AVAILABLE: Library of Congress

Card 2/2

1. Mirrors--Theory

KINBER, B. YE.

Я. Н. Хурин

Ширина спектральных линий импульсных автоколебаний

В. Л. [illegible]

О [illegible]

10 июня
(с 18 до 22 часов)

Г. М. [illegible]

Полигармонические режимы в многоконтурных автоколебательных системах и генераторах повышенной стабильности частоты

Г. Ш. Кеванишвили

К теории устойчивости автоколебаний.

М. Е. Герценштейн,
В. Б. Кинбер

Фазовые соотношения в одноконтурных параметрических усилителях

В. Н. [illegible]

О свободных колебаниях в колебательном контуре с емкостью p—n перехода

66

Г. Ш. Кеванишвили

О существовании предельного цикла в [illegible] автоколебательных системах

11 июня
(с 10 до 15 часов)

А. М. [illegible]

Новые способы [illegible]

М. Е. Жаботинский,
Ю. Л. Свердлов

Многоканальные умножители частоты

Ю. В. [illegible]

Об одном способе построения [illegible]

В. А. [illegible]

О [illegible] преобразователе частоты.

11 июня
(с 18 до 22 часов)

67

report submitted for the Centennial Meeting of the Scientific Technological Society of Radio Engineering and Electrical Communications im. A. S. Popov (VNORiE), Moscow, 8-12 June. 1959

APPROVED FOR RELEASE: 06/13/2000 CIA-RDP86-00513R000722530006-6"

KINBER, V. Ye.

В. Л. Гершман,
В. И. Михайлов

О применении спектральной теории турбулентности к задаче рассеяния от неровностей поверхности моря при волнении.

В. Е. Кинбер,
~~М. Ф. Баширова,~~
Т. Г. Тушканова

Функции распределения уровня сигнала (медленные замирания)

10 июня
(с 10 до 16 часов)

Б. Н. Гершман,
В. П. Докучаев

К теории образования ионосферных неоднородностей в слое

В. Д. Гусев,
Ю. В. Кушнеревский,
С. Ф. Миркотан

Сопоставление результатов наблюдений за крупными и мелкими неоднородностями в слое F_2

В. Д. Гусев,
С. Ф. Миркотан,

Ю. В. Березин,
М. Я. Кокошкин

О «разрешающей способности» системы, измеряющей горизонтальные размеры ионосферных неоднородностей.

В. Д. Гусев,
Н. Б. Виноградова,
Т. А. Гайлит

Статистические свойства фазы волны, отраженной от ионосферы

В. Д. Гусев,
Т. А. Гайлит

Об автоматизации обработки экспериментальных данных при исследовании нерегулярной ионосферы

10 июня
(с 18 до 22 часов)

В. А. Березушкин

Расчет надежности связи высокочастотных радиотрасс

Ш. Г. Шламович

Графо-аналитический способ расчета линий радиосвязи для различных условий работы

report submitted for the Centennial Meeting of the Scientific Technological Society of Radio Engineering and Electrical Communications im. A. S. Popov (VNORiE), Moscow, 8-12 June. 1959

26433
S/106/60/000/005/007/009
A055/A133

9.9300

AUTHORS: Bakhareva, M. F.; Kinber, B. E.

TITLE: On the problem of high-directional antennae gain losses due to tropospheric scattering

PERIODICAL: Elektrosvyaz', no. 5, 1960, 67-68

TEXT: Losses called antennae gain losses arise when high-directional antennae are used for tropospheric propagation. According to Booker and de Bettencourt [Ref. 1: "Theory of radio transmission by tropospheric scattering using very narrow beams". Proc. IRE, v. 43, no. 3, 281, 1955] these losses are due to the fact that the scattering volume decreases when the antennae gain increases, whereas Mellen, Morrow, Pote, Radford and Wiesner [Ref. 2: "UNF Long-Range Communication Systems". Proc. IRE, v. 43, no. 10, 1269, 1955] attribute them to an insufficient correlation of the scattered field in the aperture of the receiving antenna. It is shown in the present article that both these causes are identical; they merely correspond to two different ways of describing the same phenomenon. The antenna gain losses are determined by

$$A = \frac{\bar{P}_{dip}}{\bar{P}_{ant}} G_{01} G_{02}, \quad (1)$$

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where $\bar{P}_{ant}$ and $\bar{P}_{dip}$ represent respectively the average received scatter-power for the directional and the non-directional antenna and G_{01} and G_{02} represent respectively the gain of the transmitting and the receiving antenna. A calculation of the gain-losses due to the "de-correlation" ("raskorrelirovaniye") of the field in the antenna aperture shows that the power in the receiving antenna channel can be expressed by the integral over the aperture plane:

$$P_{ant} = \frac{1}{2} \frac{y}{\int\limits_{\Sigma} \varphi^2 ds} \times \iint \varphi(s) \varphi^*(s') E(s) E(s')^* dsds', \tag{2}$$

where φ is the field distribution in the antenna aperture plane at transmission-operation, Σ is the antenna area, y is the conductance of the medium. The field E (s) is the sum of the fields scattered on the permittivity fluctuations $\Delta\varepsilon$ in the scattering volume. Substituting (3) in (2), averaging for all possible $\frac{\Delta\varepsilon}{\varepsilon}$, transforming R_{os} as follows:

$$R_{os} = R_{os'} + |\vec{S} - \vec{S'}| \cos \psi \tag{5}$$

and supposing that

$$R_o \approx R'_o \approx R_1, \quad R_{os} \approx R_{o's'} \approx R_2$$

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we obtain:

$$P_{\text{ant}} = \frac{P_0 k^4 B}{(4\pi)^3} \operatorname{Re} \times$$

$$\times \iint \frac{\overline{\frac{\Delta\varepsilon}{\varepsilon}\left(\frac{\Delta\varepsilon}{\varepsilon}\right)} f_{nep}(\alpha, \beta) f^*_{nep}(\alpha', \beta')}{R_1^4 k_2^2} \times$$

$$\times \exp\{-ik[(R_0 - R_0') + $$

$$+ (R_{0s'} - R_{0s})]\} \, dv dv' \times$$

$$\times \iint_{\Sigma} \exp\{-ik\,|\vec{s} - \vec{s}'|\cos\psi\} \times$$

$$\times \varphi(s) \varphi^*(s') \, ds ds', \tag{6}$$

where $P_0 = \frac{1}{2} y E_0^2$ and $B = \frac{1}{\int_{\Sigma} \varphi^2 ds}$. The magnitude F, proportional to the square of the receiving antenna directional diagram, is:

$$F = B \int_{\Sigma} \exp(-iks' \cos\psi)\varphi(s) \, ds = \int_{\Sigma} \exp(iks' \cos\psi) \times \varphi^*(s') \, ds' =$$

$$= f_2(0, \varphi) \, f_2^*(0, \varphi) = f_2^2(0, \varphi). \tag{7}$$

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It is assumed that, in (6):

$$R_{os'} - R_{o's'} \approx R - R' \qquad (8)$$

where R and R' represent, respectively, the distance between the antenna center M and the points O and O' of the scattering volume. This assumption is admissible since points O and O' are situated in the antenna Fraunhofer region. For the same reason, the term $\frac{|\bar{S} - \bar{S}'|^2}{2 R_{os}}$ was omitted in establishing (6). The following approximation is also possible in (6):

$$f_2(\alpha', \beta') = f_2(\alpha, \beta). \qquad (9)$$

Introducing the scatter diameter, we can write:

$$\sigma(\gamma, o) = \mathrm{Re} \int_v \frac{\Delta\varepsilon}{\varepsilon} \left(\frac{\Delta\varepsilon}{\varepsilon}\right)^* \times e^{-ik\left[(R_o - R_{o'}) + (R - R')\right]} dv,$$

and, using (7) - (9), we finally obtain:

$$P_{ant} = \frac{P_o k^4}{(4\pi)^3} \int_v \frac{f_1(\alpha, \beta)^2 f_2(\gamma, \delta)^2}{R_1^2 R_2^2} \times \sigma(\theta)\, dv. \qquad (10)$$

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On the problem of high-directional ...

It ensues from (10) and (2) that the antenna-gain drop can be interpreted as the result either of the decrease of the scattering volume or of the "de-correlation" of the field in the receiving antenna aperture. There are 1 figure and 4 references: 2 Soviet-bloc and 2 non-Soviet-bloc. The two references to English-language publications read as follows: Booker, de Bettencourt, "Theory of radio transmission by tropospheric scattering using very narrow beams". Proc. IRE., v. 43, no. 3, 281. 1955. Mellen, G. L.; Morrow, W. E.; Pote, A. J.; Radford, W. H.; Wiesner, J. B.; "UHF Long-range communication systems". Proc. IRE., v. 43, no. 10, 1269, 1955.

SUBMITTED: September 2, 1959

Card 5/5

9.1300

77400
SOV/1[illegible]-1-13/[illegible]

AUTHORS: Gertsenshteyn, M. E., Kinber, B. E.

TITLE: Concerning Electrodynamics of a Resonator Containing A Girotropic Medium With Variable Parameters

PERIODICAL: Radiotekhnika i elektronika, 1960, Vol 5, Nr 1, pp 150-161 (USSR)

ABSTRACT: This is a continuation of a work by the author (this journal, 1959, Vol 4, Nr 11, p. 1774, Abstract 7[illegible]218) on the action of ferrite microwave amplifiers which can be described by a quasilinear tensor of magnetic susceptibility. The introduction of the latter reduces a complex nonlinear problem--of two interacting h-f fields in a ferrite resonator placed into a magnetic field--to two problems which can be solved consecutively: (a) calculation of the susceptibility of the substance; (b) linear electrodynamics of a weak signal. The tensor coefficients depend on the static magnetic field and on the alternating pumping field. That is, they are functions of the coordinates, depend on the

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frequency of the signal, and are periodic time functions. The dependence of μ on time is caused by the pumping field. The present work analyzes: (a) quadratic relations analogous to the law of energy conservation with $\varepsilon = \varepsilon(t)$ and $\mu = \mu(t)$; (b) distribution resolution of the field according to normal oscillations of resonator; (c) certain peculiarities of "magnetostatic" longitudinal fields. The method permits a calculation of both 'steady state' and rotational fields. The medium with varying ε and μ will further be called active medium. (1) Quadratic relations for fields in a medium without dispersion. Maxwell's equations for active media are:

$$\operatorname{rot} \mathbf{H} - \frac{1}{c}\dot{\mathbf{D}} = \frac{4\pi}{c}\mathbf{j}, \quad (1)$$

$$\operatorname{rot} \mathbf{E} + \frac{1}{c}\dot{\mathbf{B}} = 0, \quad (2)$$

$$\operatorname{div} \mathbf{D} = 4\pi\rho, \quad (3)$$

$$\operatorname{div} \mathbf{B} = 0 \quad (4)$$

and they differ from normal media equations by the additional material equations:

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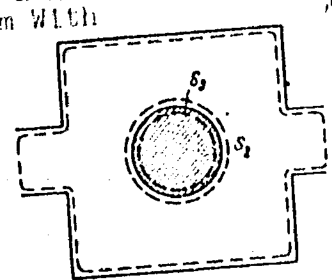

The surface of integration consists of (S_1) which is the metal surface of the in- and output orifices; (S_2) the surface adjacent to and outside the active substance; (S_3) same, but inside it (see fig. above). (S_2) and (S_3) are infinitely near to each other and the sum of integrals per (S_2) and (S_3) equals zero. The authors introduce two designations:

$$P_+ = \frac{c}{4\pi}\int_{S_{\text{вых}}} [EH]\,dS,$$

$$P_- = \frac{c}{4\pi}\int_{S_{\text{вх}}} [EH]\,dS.$$

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Concerning Electrodynamics of a Resonator Containing A Girotropic Medium With Variable Parameters

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and substitute them into (9) which changes to:

$$P_+ - P_- = \frac{d}{dt}\frac{1}{8\pi}\int(\varepsilon E, E) + (\mu H, H)\,dv + \frac{1}{8\pi}\int(\dot{\varepsilon} E, E) + (\dot{\mu} H, H)\,dv. \quad (9a)$$

The above is averaged for a sufficiently long period of time. While (9) contains exact solutions for E and H which are unknown to us, Eq. (9a) can be considered as an approximate solution of the field structure. Relations similar to (9) can also be obtained for nonsteady-state processes in a system with self-excitation. (2) Equations for amplitudes of normal waves in a resonator with a dispersionless medium. The authors consider the field of a resonator partially or totally filled with an active substance where $\varepsilon = \varepsilon(t)$ and $\mu = \mu(t)$. The average value of tensors ε and μ-components independent of time are:

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By transformation of (1) and (2) in accordance with (11) and (12) and substitution, the authors obtain:

$$i\sum_q \omega_q b_q \varepsilon^0 E_q = \sum_s \left\{\dot{a}_s \varepsilon^0 + \frac{d}{dt}(a_s \varepsilon_1)\right\} E_s + 4\pi j^e, \tag{14}$$

$$i\sum_s a_s \omega_s \mu^0 H_s = \sum_q \left\{\dot{b}_q \mu^0 + \frac{d}{dt}(b_q \mu_1)\right\} H_q - 4\pi j^m,$$

where j^e are the external sources of electric current, and j^m are the external sources. From the above two equations, Eq. (15) is found:

$$ib_q\omega_q = \dot{a}_q + \sum_s \frac{d}{dt}(\varphi_{qs} a_s) + A_q, \tag{15}$$

$$ia_q\omega_q = \dot{b}_q + \sum_s \frac{d}{dt}(\psi_{qs} b_s) + B_q,$$

where

$$\varphi_{qs}(t) = \int E_q \varepsilon_1(r, t) E_s dv; \quad A_q = 4\pi \int j^e E_q dv;$$

$$\psi_{qs}(t) = \int H_q \mu_1(r, t) H_s dv; \quad B_q = 4\pi \int j^m H_q dv.$$

The differential equations (15) are a linear system with variable coefficients and an infinitely great number of unknowns a_q and b_q. In the simplest case when only one resonance pair of amplitudes, a_1 and b_1, are essential, Hill's equation is valid (second order linear equation with periodic coefficients):

$$-\omega^2 b = \frac{d}{dt}\left\{(1+\varphi)\frac{d}{dt}[b(1+\psi)+B]\right\} + i\omega A, \tag{17}$$

$$-\omega^2 a = \frac{d}{dt}\left\{(1+\psi)\frac{d}{dt}[a(1+\varphi)+A]\right\} + i\omega B. \tag{18}$$

$$i\sum_s b_q\omega_q Q_{sq}^{(e)}(\omega) = \sum_s \dot{a}_s Q_{sq}^{(e)}(\omega) + \sum_s \frac{d}{dt}(\varphi_{qs} a_s) + A_q,$$
$$i\sum_s a_q\omega_q Q_{sq}^{(m)}(\omega) = \sum_s \dot{b}_s Q_{sq}^{(m)}(\omega) + \sum_s \frac{d}{dt}(\psi_{qs} b_s) + B_q. \qquad (24)$$

Here, φ_{qs} and ψ_{qs} (and in that they are different from the case without dispersion) depend also on the frequency ω of the amplified signal. The non-diagonal terms Q_{sq} are due to the dispersion. Without dispersion $Q_{sq} = \delta_{sq}$. (4) Longitudinal fields. When the resonator is filled with a gyrotropic medium having dispersion properties, these fields can resonate, as was first found by White (see U.S. ref). These fields, which must be included into the full wave system of the resonator, are solutions of Maxwell's equations with the tensor of magnetic susceptibility being taken in consideration for a substance showing dispersion. These fields are analogous to oscillations in electronic plasma when $\varepsilon \leqslant 0$. As in plasma, these fields are called longitudinal to distinguish them from rotational fields. When the ferrite size is small, in its vicinity, the rotational field component can be disregarded. By introducing scalar potential Ψ:

$$H = -\operatorname{grad}\Psi \tag{25}$$

and substituting (25) into (4):

$$-\operatorname{div}\mu\operatorname{grad}\Psi = \mu_{ik}\frac{\partial^2\Psi}{\partial x_i\partial x_k} + \frac{\partial\mu_{ik}}{\partial x_i}\frac{\partial\Psi}{\partial x_k} = 0. \tag{26}$$

is obtained. For the particular case of a homogeneous medium in a uniform constant field. (26) changes into Walker's equation (see ref):

$$\frac{\partial^2\Psi}{\partial z^2} + (1+k)\left(\frac{\partial^2\Psi}{\partial x^2} + \frac{\partial^2\Psi}{\partial y^2}\right) = 0 \tag{28}$$

in ferrite, and

$$\Delta\Psi = \frac{\partial^2\Psi}{\partial z^2} + \frac{\partial^2\Psi}{\partial x^2} + \frac{\partial^2\Psi}{\partial y^2} = 0$$

in the air. The authors prove further that the quadratic form $\mu_{ik}\, n_i n_k$ (where n is an arbitrary single vector) must have an alternating sign in the case when a natural magnetostatic oscillation is present. The above solutions for longitudinal waves are approximations, as, strictly speaking, rotation fields cannot be neglected. For ferrites with $\varepsilon > 0$ dispersion, ε can be disregarded, and from rot H = 0 it follows that E = 0. In the presence of dispersion the energy flux is:

$$S = \frac{c}{4\pi}[EH^*] + \frac{\omega}{8\pi}\frac{d\mu}{dk}HH^*, \tag{34}$$

where **k** is the wave vector. Since $d\mu/dk = 0$, **E** = 0 and the energy flux in magnetostatic approximation

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is always equal to zero. Therefore, a magnetostatic solution without rotation components shows only the oscillation spectrum but cannot describe its energy effect. There is a mathematical addendum containing the derivations of "orthogonality ratios" for media with dispersion. There are 1 figure; and 17 references, 13 Soviet, 4 U.S. The U.S. references are: M. T. Weiss, Phys. Rev., 1957, 107, 1, 317; H. Suhl, Jour. Appl. Phys., 1957, 28, 11, 225; R. L. White, J. H. Solt, Phys. Rev., 1956, 104, 56; L. R. Walker, Phys. Rev., 1957, 105, 2, 390.

SUBMITTED: July 3, 1958

Card 14/14

9.3240

77956
SOV/109-5-3-10/26

AUTHOR S: Gertsenshteyn, M. E., Kinber, B. E.

TITLE: Phase Selectivity of Single-Circuit Parametric Amplifier

PERIODICAL: Radiotekhnika i elektronika, 1960, Vol 5, Nr 3, pp 422-429 (USSR)

ABSTRACT: In contrast to conventional oscillators, the phase of oscillations generated by self-excitation in parametric systems is determined by the phase of parametric modulation. Therefore, one can expect that a parametric amplifier will react on the phase of signal being amplified. Let it be called phase selectivity. The article deals with phase selectivity of a parametric amplifier with one degree of freedom (with reference to amplified signal). The phase selectivity causes a certain signal distortion, which disappears if several degrees of freedom are possible. Nevertheless, the parametric amplifier with one degree of freedom is of a certain interest, since it is much simpler. While phase

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Parametric Amplifier

selectivity has been studied in several Soviet works
(by L. I. Mandel'shtam and N. D. Papaleksi; by S. M.
Rytov and M. Divil'kovskiy), it is not mentioned in the
recent paper of Bloom and Chang (see U.S. ref). (1)
Mathematical Equation of Problem. The initial equation
describing amplification in a parametric amplifier with
one degree of freedom is Mathieu equation with the right
side:

$$\ddot{y} + 2\delta\dot{y} + \omega_0^2 (1 + q \sin \nu t)\, y = \omega_0^2 f \cos \Omega t, \tag{1}$$

where y(t) is instantaneous value of amplified signal
in circuit; δ, decrement of circuit fading without
parametric excitation (when q = 0); q, relative para-
meter modulation depth, i.e., amplitude of variable
frequency component of the circuit; ν, frequency of
variable component of magnetic susceptibility (pump
field frequency); ω_0, circuit frequency without

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parametric excitation (q = 0); $\omega_0^2 f$ and Ω, amplitude
and frequency, respectively, of signal being amplified
at amplifier input. Q-factor of the system is assumed
sufficiently high: $\delta \ll \omega_0$. (2) Amplitude and Phase
Equations. A solution of (1) is sought as:

$$y = A(t) \cos [\Omega t + \varphi(t)], \tag{2}$$

where A and φ are the slowly changing functions sought:
$\dot{A} \ll \omega_0$; $\dot{\varphi} \ll \omega_0$ and $\dot{A} \ll \delta$; $\dot{\varphi} \ll \delta$. After simplifi-
cations and substitutions, an equation containing only
φ is obtained:

$$\frac{\cos\varphi}{\sin\varphi} = \varkappa \frac{\sin(2\varphi - [illegible])}{1 + \varkappa\cos(2\varphi - [illegible])} \tag{3}$$

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Figure 2 shows the graph of regeneration coefficient k(τ) for $\varkappa$ = 0.5; 0.9; k(τ) is ratio of amplitudes with and without regeneration:

$$k(\tau) = \frac{\sin\tau}{1 - \varkappa\cos(\tau - 2\varphi)}. \tag{9}$$

Figure 3 shows the graph for φ_{max} ($\varkappa$), from which it appears that the maximum phase value can approach $\pi/2$. Figure 4 shows the graph of function $a = \tau - 2\varphi$ which is near $\pi/2$ most of the time, except for time intervals when τ is near $n\pi$. For a linear device, the mean value of regeneration coefficient per period is:

$$\bar{k} = \frac{1}{\pi}\int_0^{\pi} k\,d\tau = \frac{1}{1+\varkappa} + \frac{4}{\pi}\frac{\varkappa}{1-\varkappa^2} \tag{12}$$

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which is near to k_{max}. Figure 5 shows k_{max}, k_{min}, $\bar{k}$ vs. $\varkappa$. The $\bar{k}$ and $\sqrt{(k')^2}$ curves were calculated under the assumption that φ is independent of τ, i.e., that $\varphi = \pi/2$. Curve $\sqrt{(k')^2}$ applies to a quadratic device, such as a power meter, whereas $\bar{k}$ curve is that of a linear device (e.g., a superheterodyne receiver with a second linear detector). From the above analysis it follows that the signal amplification in a parametric system with one degree of freedom changes periodically resulting in a distorted signal. Beat cycle is determined by the frequency difference between harmonics of pumping field and second harmonics of signal. If a filter passing only one of the frequencies (Ω or $\nu - \Omega$) is inserted, the amplified signal is not distorted. (4) Method of Complex Amplitudes. In Eq. (1) the right side is written as:

$$\frac{\omega_0^2 f}{2}\left[e^{i\Omega t} + e^{-i\Omega t}\right]$$

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and the term with negative frequency, $e^{-i\omega t}$, is excluded. Assuming that only resonance frequencies are essential: positive $\Omega \simeq \omega_0$ and negative $\Omega - \nu = -\mu$, for $\nu \sim 2\omega_0$; $|\mu| \sim \omega$ and approximate solutions are sought as combinations of harmonics with frequencies Ω and $\Omega - \nu$:

$$y = ae^{i\Omega t} + be^{-i\mu t}, \tag{13}$$

where

$$\mu = \nu - \Omega > 0, \tag{14}$$

a and b are the constants sought. The location of frequencies is shown in Fig. 6a. Positive frequencies μ and Ω are located symmetrically with reference to one-half the pumping frequency (Fig. 6b). The solution sought is given as:

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For a transition from a complex form of solution to normal, its real part is taken and complex conjugated terms added. Rejecting negative frequencies, the following equation results:

$$\operatorname{Re} y = \frac{1}{2}(y + y^*) = -\frac{[1 - \varkappa e^{i\tau}]}{1 - \varkappa^2} 2 \sin \Omega t. \qquad (20)$$

The expression for amplitude and phase of amplification is:

$$|k| = \frac{[1 + \varkappa - 2\varkappa \cos\tau]^{1/2}}{1 - \varkappa^2}, \qquad (21)$$

$$\arg k = \operatorname{arc\,tg} \frac{\varkappa \sin\tau}{1 + \varkappa\cos\tau}. \qquad (22)$$

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This coincides with (7) obtained from simplified equations. Comprehensible explanation of phase selectivity can be made as follows: Since the results by the more exact method of shortened equations and by the simpler method of complex amplitudes are the same, the latter method can also be used for more complicated cases, when the first one is no longer adequate. This applies to the amplifier with two degrees of freedom, where it is possible to eliminate beats by separating frequencies μ and Ω in the spectral apparatus. In the circuit are oscillations of two frequencies--positive Ω and negative $\Omega - \nu = -\mu$, which are mirror images with reference to $\nu/2$, and beats of these frequencies are observed in load resistance. (5) Amplification of Modulated Signals by a Parametric Amplifier. Above, the amplification of a harmonic signal was analyzed. For analysis of a differently shaped signal, the spectral expansion is used. Complex transmission coefficient is:

$$k = k_1(\omega) + k_2(\omega) e^{i\tau}, \qquad (23)$$

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where coefficients k_1 and k_2 are:

$$k_1 = \frac{\omega_0^3}{2D(\omega)}[\omega_0^2 - \mu^2 - 2i\delta\mu], \tag{24}$$

$$k_2 = \frac{\omega_0^2 q}{D(\omega)}. \tag{25}$$

Analyzing the amplification of signal $e^{i\Omega t}f(t)$ and multiplying its spectrum by the regeneration coefficient, by a reversed Fourier transformation we obtain:

$$y = \int_{-\infty}^{+\infty} e^{i\omega t}[1 - \varkappa e^{i(\nu - 2\omega)t}]\psi(-\Omega + \omega)\,d\omega = f(t)e^{i\Omega t} -$$

$$- \varkappa e^{i\nu t}\int_{-\infty}^{+\infty} e^{-i\omega t}\psi(\omega - \Omega)\,d\omega = f(t)e^{i\Omega t} -$$

$$- \varkappa e^{i(\nu - \Omega)t}\int_{-\infty}^{+\infty} e^{-i\omega t}\psi(\omega)\,d\omega = [f(t) - \varkappa f_2(t)e^{i\tau}]e^{i\Omega t}, \tag{27}$$

where

$$f_2(t) = \int_{-\infty}^{+\infty} e^{i\omega t}\psi(\omega)\,d\omega.$$

Thus, in the case of a signal of any shape, phase selectivity is also present. (6) Noise Amplification. White spectrum noise is the totality of incoherent sinusoids with arbitrary phases; their amplification coefficient is (21). With a quadratic indicator, it is:

$$|k^2| = \frac{1 + x^2}{(1 - x^2)^2}. \quad (29)$$

Consequently, phase selectivity does not play any role in noise amplification. Equation (29) is also valid if not only the phase of the amplified signal, but also the phase of the pumping field is arbitrary (or at

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random). It seems that the field of an incoherent source can be used as the pumping field. Noises and distortions of such an amplifier, of course, should be investigated separately. (7) Influence of Phase Selectivity. From the above, it follows that phase selectivity leads to amplitude and phase modulation of the signal being amplified. Pulses at the output of a parametric amplifier are amplitude-modulated. This modulation can be removed with the help of a system of automatic amplitude regulation in the receiver. Analyzing FM of the signal, the spectral method is recommended. Conclusions: (1) A parametric amplifier with one degree of freedom, when amplifying a signal with frequency Ω, causes a beat modulation of the amplified signal, resulting in phase oscillations $\nu - 2\Omega$. (2) Solutions for near-resonance area by simplified equations and complex amplitude methods are identical, and the method of complex amplitudes can be used for the solution of more complicated problems. (3) A parametric amplifier with one degree of freedom is phase-selective, as its instant

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amplification factor depends on the phase of the incoming signal. (4) Due to phase selectivity, output signal is modulated in amplitude and phase with a cycle of $2\pi/(\nu - 2\Omega)$. There are 6 figures; and 9 references, 6 Soviet, 3 U.S. The U.S. references are: H. Heffner, G. Wade, Gain, Band, Width, and Noise Characteristics of the Variable Parametric Amplifier, J. Appl. Phys., 1958, 29, 9, 1321; S. Bloom, K. Chang, Theory of Parametric Amplification Using Nonlinear Reactances, RCA Rev. 1957, 18, 4, 578; W. Whirry, F. Wang, Phase Dependence of a Ferromagnetic Microwave Amplifier, Proc. IRE, 1958, 46, 1657.

SUBMITTED: May 30, 1959

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9.9000

77970
SOV/109-5-3-24/26

AUTHOR: Kinber, B. Ye.

TITLE: On Slow Fadings of Signal During Tropospheric Scattering (Brief Communication)

PERIODICAL: Radiotekhnika i elektronika, 1960, Vol 5, Nr 3, pp 521-522 (USSR)

ABSTRACT: It is generally known that the median hourly signal level during tropospheric scattering follows the normal-logarithmic distribution. The present communication shows that this distribution can be determined under the assumption that the slow fadings are related to the variations of refraction. The complete fading (in db) can be considered as consisting of the fading in free space, and additional fading α_a. Experiments did show that a linear relation exists between α_a and the distance. (This linear relation approximates the experimental results very closely for distances of 120-400 km, and was determined for average meteorological

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conditions.) It is assumed that the actual argument of this relation is not the distance itself, but the angular distance for mean refraction $\theta = R/\bar{a}_e$, where $\bar{a}_e = 8{,}400$ km is mean effective radius of the earth. Refraction variations (gradient of dielectric permeability of air g) change the angular distance $\theta = R/a_e$ and cause slow fadings. The concurrent value of the angular distance θ is connected with a mean value $\bar{\theta}$ by a simple relation:

$$\theta = \bar{\theta}\left[1 + \frac{\bar{a}_e}{2}(g - \bar{g})\right] = \frac{R}{\bar{a}_e} + \frac{R(g - \bar{g})}{2}. \tag{1}$$

Since θ depends linearly on g, a_e is in linear relation to θ, but the gradient g is distributed per normal law; slow fadings follow the normally-logarithmic distribution. The root-mean-square deviation σ_f of slow

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On Slow Fadings of Signal During Tropospheric Scattering (Brief Communication)

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fadings is connected with the root-mean-square deviation for the gradient σ_g by the relation:

$$\sigma_f = \frac{d\alpha_a}{dg}\sigma_g = \frac{d\alpha_a}{d\theta}\frac{d\theta}{dg}\sigma_g. \qquad (2)$$

Differentiating (1) and substituting $\sigma_g = 6\cdot10^{-8}\ \text{м}^{-1}$ [6], $\frac{d\alpha_a}{d\theta} = \frac{2}{3}\cdot10^{3}(db/rad)$ into (2), we get:

$$\sigma_{\text{ма}}(db) = 0{,}02\,R\,(\text{км}). \qquad (3)$$

Figure B shows a good agreement of Eq. (3) with experiments. There are 1 figure; and 8 references, 2 Soviet, 6 U.S. The U.S. references are: K. Bullington, Proc. I.R.E., 1953, 41, 1, 132; J. H. Chisholm, P. A. Portmann, J. T. Bettencourt, J. S. Roshe, Proc. I.R.E.,

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On Slowing Fadings of Signal During Tropospheric Scattering (Brief Communication)

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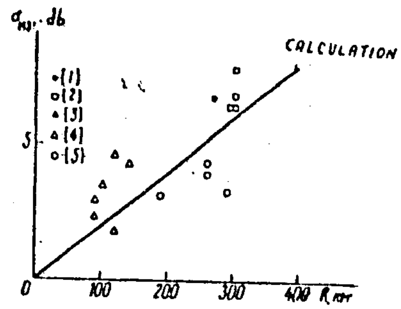

Fig. B. Mean-root-square of slow fadings deviation vs. path length.

1955, 43, 10, 1317; G. Dinger, B. Garner, D. Hamilton, A. Titchen, Proc. I.R.E., 1958,46,7,1401; B. Josephson, D. Carlson, IRE Trans., 1958, AP-6,2,176; G. L. Mellen, W. E. Morrow, A. J. Pote, W. H. Radford, J. B. Wiesner, Proc. I.R.E., 1955,43,10,1269; D. H. Jerks, Proc. I.R.E., 1955,43,10,1290.

SUBMITTED: June 4, 1959

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69914
S/109/60/005/05/002/021
E140/E435

9.1000

AUTHOR: Kinber, B.Ye.

TITLE: The Space Structure of the Radiation Pattern and Polarization of Radiation from an Axially-Symmetrical Reflector Antenna

PERIODICAL: Radiotekhnika i elektronika, 1960, Vol 5, Nr 5, pp 720-726 (USSR)

ABSTRACT: The space pattern and radiation polarization of an axially-symmetrical reflector antenna excited by combined electric and magnetic dipoles are calculated. It is shown that for radiation close to the antenna axis the cross-polarization diagram is the half-difference of the E- and H-plane patterns. The fraction of energy expended in the cross-polarization radiation and the ratio of directivities in the fundamental and cross-polarization components are calculated. Jones (Ref 3) demonstrated that with a horn exciter the cross-polarization of the radiation pattern should be appreciably diminished. However, this is not borne out in practice. This is due to the fact that the wave in the horn is not a plane wave but consists of at least two plane waves propagating at

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The Space Structure of the Radiation Pattern and Polarization of Radiation from an Axially-Symmetrical Reflector Antenna

an angle to each other. The basic fraction of cross-polarization energy is expended in the side lobes. There are 6 figures and 4 references, 3 of which are Soviet and 1 English.

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SUBMITTED: March 18, 1959

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S/109/60/005/009/006/026
E140/E455

AUTHOR: Kinber, B.Ye.

TITLE: The Screening Condition in Relation to the Diffraction Correction to the Current Distribution

PERIODICAL: Radiotekhnika i elektronika, 1960, Vol.5, No.9, pp.1407-1416

TEXT: The article concerns the diffraction problem for an ideally conducting body, solved by finding the induced current on the surface of the body. Earlier work (Ref.2) showed that bodies with small curvature have a current distribution approaching the asymptotic expression Eq.(1). It is found that higher-order terms in the series expansion of the current have a substantial effect on the field in the shadow zone and on the cross-polarization radiation of a reflector. The author introduces a "screening condition" to simplify determination of the current. If the reflector is assumed infinite (exceedingly large in comparison with wavelength) the field in the shadow zone is subject to the screening condition - the field outside a closed ideally conducting surface enclosing a radiator is zero. Then, the correction to the current distribution on an infinite
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The Screening Condition in Relation to the Diffraction Correction to the Current Distribution

reflector must be such as to reduce the field in the shadow zone to zero. This correction takes into account all factore, i.e. curvature and nearness of the radiator. These two factors may be separated by simultaneous application of the screening condition to the given surface and to its tangent plane, the latter giving exclusively the contribution of the primary radiator near field. The method is applied to a paraboloid. For infinite reflectors the correction found from the screening condition agrees in character with that following from the rigorous solution. Taking the correction into account appreciably alters the structure of the back and side radiation of the reflector. There are 2 figures and 14 references (11 Soviet and 3 English.

SUBMITTED: September 22, 1959

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S/109/60/005/010/022/031
E033/E415

AUTHORS: Kinber, B.Ye. and Bakhareva, M.F.

TITLE: Reliability of a System of Diversity Reception of Two Unequal Correlated Signals

PERIODICAL: Radiotekhnika i elektronika, 1960, Vol.5, No.10, pp.1726-1727

TEXT: In investigations into the reliability of diversity reception of tropospheric signals, the statistics of uncorrelated and correlated signals have been examined on the assumption that the average powers of the signals in the various channels are equal. In practice, this assumption is not generally true, since the receivers and antennae are not identical. In this short communication, the distributions of the level in a system which selects the best signal from two unequal correlated relay signals is obtained. It is shown that for high reliability and not too large correlation, this system is equivalent to a system of diversity reception of two equal uncorrelated signals with small average power. The reliability $P(E > E_0)$ of a double-reception system, which selects the best signal, equals

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Reliability of a System ...

$$P(E > E_0) = 1 - \iint_0^{E_0} W(E_1, E_2)\, dE_1 dE_2, \tag{1}$$

where W is a two-dimensional distribution function. For unequal correlated relay signals the function W has the form

$$W(E_1, E_2) = \frac{E_1 E_2}{\sigma_1^2 \sigma_2^2 p'^2} I_0\left(\frac{p}{p'^2}\frac{E_1}{\sigma_1}\frac{E_2}{\sigma_2}\right)\exp\left(-\frac{E_1^2}{2\sigma_1^2 p'^2} - \frac{E_2^2}{2\sigma_2^2 p'^2}\right), \tag{2}$$

where $\sigma_i^2 = \frac{\bar{E}_i^2}{2}$, $i = 1,2$, I_0 is a Bessel function (imaginary argument), $p'^2 = 1 - p^2$, and p is related to the correlation coefficient R between the signals by the relationship

$$R = 0.921p^2 + 0.0576p^4 + 0.0144p^6 + \ldots.$$

It is shown that for high reliability $\left(\frac{E_0}{\bar{E}}\right)^2 \ll 1$ and small

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correlation R, the distribution of unequal correlated signals can be presented in the form

$$P(E > E_0) = 1 - \left[1 - e^{-\frac{1}{\sqrt{1-p^2}} \frac{E_0^2}{\bar{E}_1 \bar{E}_2}}\right]^2, \tag{10}$$

i.e. as the mutual distribution of two equal uncorrelated signals, the average power of which equals $E_1 E_2 \sqrt{1 - p^2}$. The reliability gain α of the system of two unequal correlated signals compared with a system of two equal uncorrelated signals does not depend on the reliability and equals

$$\alpha = \frac{\dfrac{E_0}{\bar{\bar{E}}}}{\dfrac{E_0}{\sqrt{\bar{E}_1 \bar{E}_2}\sqrt[4]{1-p^2}}}. \tag{11}$$

The dependence of α(db) on the ratio of the average levels $\bar{E}_2/\bar{E}_1$(db) is shown graphically (calculated by Eq.(11) for p = 0; 0.2; 0.4; 0.6 and $\bar{E} = E_1$)., ~~There are 1 figure and~~

BAKHAREVA, M.F.; KINBER, B.Ye.

Loss of gain of pencil-beam antennas along the paths of tropospheric scattering. Elektrosviaz' 14 no.5:67-68 My '60. (MIRA 13:8)
(Antennas (Electronics))

28787
S/106/61/000/006/003/005
A055/A127

9.1914 (1127)

AUTHORS: Pokras, A. M. and Kinber, B.E.

TITLE: Radiation pattern of a periscopic system with ellipsoidal radiator.

PERIODICAL: Elektrozvyaz', no. 6, 1961, 22 - 30

TEXT: The data already published on the radiation properties of a periscopic antenna system [Ref. 5: Antennaya sistema s otrazhayushchim zerkalom (Antenna system with reflecting mirror), Radiotekhnika, 1956, vol. 11, No. 3 and Ref. 6: G. Z. Aysenberg, Antenny ul'trakorotkikh voln (Ultrashort-waves Antennae), Svyazizdat., 1957] are not complete and concern essentially the systems with a parabolic radiator. The present article presents a comprehensive analysis of the radiation pattern of a periscopic system with an ellipsoidal radiator. Neither the edge effects, not the influence exerted by the support, by the reflection from local objects etc. are taken into account in the calculations. The main lobe of the radiation pattern: - According to an earlier article by B. E. Kinber and A. M. Pokras [Ref. 4: O postanovke zadachi v teorii pereskopicheskoy antenny

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(On the problem thesis of the theory of perescopic antennae), Radiotekhnika, 1957, vol. 12, No. 7] the radiation pattern $F(\varphi, \theta)$, for a system with a flat reradiator and with the field distribution in the output aperture plane determined by F_0 (x, y) is:

$$F(\varphi, \theta) = \int_{S_1} e^{ik(x_1 u + y_1 v) \; \frac{ik}{2d}(x_1^2 + y_1^2)} dx_1 dy_1 \times$$
$$\times \int_{S_0} e^{i\frac{k}{d}(x_0 x_1 + y_0 y_1)} F_0(x_0 y_0) \, dx_0 dy_0 \qquad (1)$$

where $u = \sin\varphi \cos\theta$, $v = \sin\theta$, $K = 2\pi/\lambda$ and d is the distance between radiator and reradiator. The coordinate system is shown in Figure 1. The indices 0 and 1 refer to the aperture of the radiator and reradiator respectively. S_0 and S_1 are the radiator and reradiator aperture areas. The most interesting systems are those with reradiators whose projection on the plane perpendicular to the pattern maximum is square, rhombic or circular, by the authors called systems with square, rhombic or circular apertures. For systems with square apertures, the field distribution in the output aperture can be approximately represented as the product of functions of x_1 and y_1. The directional pattern is then:

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$$F(n_1, n_2) = g(n_1)g(n_2) \qquad (2)$$

where $n_1 = kau$; $n_2 = kav$; a is the dimension of the reradiator aperture. For systems with rhombic apertures, the expression for the pattern is:

$$F = g\left(\frac{\varphi + \theta}{\sqrt{2}}\right) \; g\left(\frac{\theta - \varphi}{\sqrt{2}}\right) \qquad (3)$$

For systems with circular apertures, and with the field distribution symmetrical with respect to the axis, the pattern is:

$$F\left(\sqrt{\varphi^2 + \theta^2}\right) = \int_0^a f_{r_{pl}}(r) J_0\left(kr\sqrt{\theta^2 + \varphi^2}\right) r\,dr. \qquad (4)$$

Co-factors g for the main lobe of the pattern in systems with an ellipsoidal radiator and flat reradiator are determined by the following formula derived from (1):

$$g(n) = N\int_{-1}^{+1} e^{in\frac{x_1}{a}} \; e^{-i\frac{\pi}{8}m\left(\frac{x_1}{a}\right)^2} d\left(\frac{x_1}{a}\right) \times \int_{-1}^{+1} e^{iX_0\frac{x_1}{a}\frac{x_0}{b}} \left[1 - k_0\left(\frac{x_0}{b}\right)^2\right] d\left(\frac{x_0}{b}\right) \qquad (5).$$

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In case of a parabolic reradiator, formula (6) is used:

$$g(n) = N\int_{-1}^{+1} e^{in\frac{x_1}{a}} d\left(\frac{x_1}{a}\right)\int_{-1}^{+1} e^{i\gamma_0\frac{x_1}{a}\frac{x_0}{b}} \left[1-k_0 \left(\frac{x_0}{b}\right)^2\right] d\frac{x_0}{b} \tag{6}$$

where $x_0 = kab/d$; 2a and 2b are the dimensions of the reradiator and radiator apertures; $m = 8a^2/\lambda d$. Calculations were made (with an electronic computer BESM) according to formulae (5) and (6) for the following cases: $k_0 = 0$, $k_0 = 0.68$ and $k_0 = 1$ (in all cases $n = 0 \div 10$, $\Delta n = 0.1$). The results of these calculations led the authors to the following conclusions: For small x_0 and for small quadrantal errors (small values of $m = 8a^2/\lambda d$), the shape of the pattern is the usual one and does not depend much on x_0 (whatever be the distribution-type in the radiator). As m increases, the main lobe widens and joins the first side lobes. For large values of x_0 and m, two factors intervene. On the one hand, when $x_0 \gg 1$, the pattern tends to approximate the shape of the distribution in the radiator aperture, inasmuch as the field distribution in the radiator aperture, and the pattern are connected by a double Fourier transformation. On the other hand, for large values of x_0 and with drooping distributions on the radiator, the field amplitude at the reradiator edges is small and the phase non-linearity has but little effect. The pattern approximates the shape of the distribution on the radiator aperture, and a considerable difference can only occur for very large values of m. Long-distance side radiation. - In the determination of the long-distance side radiation, it is necessary to effect integration directly over the reradiator surface, and it is impossible to neglect the vector nature of the currents. The directional pattern F can be represented as

$$\bar{F} = F\bar{\Pi} \tag{7}$$

$\bar{\Pi}$ being the polarization factor. To apply formulas (1) to (6), it is sufficient to replace u and v by new arguments u_3 and v_3, linearly related to them. The successive transformation of u and v are

$$\left.\begin{aligned} u_1 &= u; \quad v_1 = \sqrt{2v} \\ u_2 &= u; \quad v_2 = \sqrt{2}\left(v - \frac{\sqrt{2}}{2}\right) \\ u_3 &= u; \quad v_3 + \sqrt{2}\left[\frac{\sqrt{2}}{2} v + \frac{\sqrt{2}}{2} w - \frac{\sqrt{2}}{2}\right] = v + w - 1 \end{aligned}\right\} \tag{8}$$

where $u = \cos\vartheta \sin\varphi$, $v = \sin\vartheta$, $w = \cos\vartheta\cos\varphi$. Substituting u_3 and v_3 in (1) or (6), the authors obtain formulae for the determination of the scalar co-factor in the case of long-distance side radiation. Important are usually, not the side lobes themselves, but their envelopes. a) Square apertures - The distribution in the aperture being:

$$f(x,\ y) = \cos\left(\frac{x_1}{a}\ \mathrm{arc}\cos T\right)\cos\left(\frac{y_1}{a}\ \mathrm{arc}\cos T\right) \tag{9}$$

the pattern will be the product of two co-factors.

$$\left.\begin{aligned} F(n_1;\ n_2) &= g(n_1)\ g\ (n_2) \\ n_1 = ka\ u;\ n_2 &= ka\ v \end{aligned}\right\} \tag{10}$$

$$g(n) = \frac{\sin(n+\alpha)}{n+\alpha} + \frac{\sin(n-\alpha)}{n-\alpha} \tag{11}$$

where α = arc cos T. The following formula is obtained for the envelope of the lobes:

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$$\tilde{F}(\varphi,\theta) = \left(\frac{\alpha\cos\alpha}{\sin\alpha}\right)^2 \frac{1}{ka[\sin\theta + \cos\theta\cos\varphi - 1]} \frac{1}{ka\cos\theta\sin\varphi} \qquad (14)$$

In the vertical plane, the formula is:

$$\tilde{F}(\theta, 0) \approx \frac{\alpha\cos\alpha}{\sin\alpha} \frac{1}{ka\,[\sin\theta + \cos\theta - 1]} \qquad (15)$$

In the horizontal plane, the formula is:

$$\tilde{F}(0,\varphi) = \left(\frac{\alpha\cos\alpha}{\sin\alpha}\right)^2 \frac{1}{ka\,[\cos\varphi - 1]} \frac{1}{ka\,|\sin\varphi|}$$

b) Circular aperture. - If the distribution is $1 - k_1(r/a)^2$, giving a droop down to level $1 - k_1$ at the edge, the directional pattern can be expressed as:

$$F(n) = \frac{1}{1-\frac{k_1}{2}}\left[(1 - k_1)\Lambda_1(n) + \frac{1}{2}k_1\Lambda_2(n)\right] \qquad (17)$$

where $n = ka\sqrt{u^2 + v^2}$, and $\Lambda_1 = \frac{2J_1(n)}{n}$ and $\Lambda_2 \frac{8J_2(n)}{n^2}$ are lambda functions. The formula for the envelope is:

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Radiation pattern of a ....

$$\tilde{F}(n) = 2\sqrt{\frac{2}{\pi}}\,\frac{1}{1-\frac{k_1}{2}}\,\frac{1}{|n|^{3/2}}\left[(1-k_1)^2+\left(\frac{2k_1}{n}\right)^2\right]^{1/2} \qquad (19)$$

c) Rhombic apertures. - The formula for the envelope of the side lobes is:

$$\left.\begin{aligned}\tilde{F}(\varphi,\theta) \approx \left(\frac{\alpha\cos\alpha}{\sin\alpha}\right)^2 \frac{\sqrt{2}}{ka[\sin\varphi\cos\theta-\sin\theta-\cos\theta\cos\varphi+1]} \times \\ \times \frac{\sqrt{2}}{ka[\sin\varphi-\cos\theta+\sin\theta+\cos\theta\cos\varphi-1]}\end{aligned}\right\} \qquad (22)$$

The polarization factor $\overline{\Pi}$ of the radiation pattern (17) has two components:

$$\left.\begin{aligned}\overline{\Pi} &= \bar{i}_\varphi\,\Pi_\varphi + \bar{i}_\theta\,\Pi_\theta\\ \Pi &= (j_0, i_\varphi)\\ \Pi &= (j_0, i_\theta)\end{aligned}\right\} \qquad (25)$$

where:

$$\left.\begin{aligned}\bar{i}_\theta &= -\bar{i}\sin\theta\cos\varphi - \bar{j}\sin\theta\sin\varphi + k\cos\theta\\ \bar{i}_\varphi &= -\bar{i}\sin\varphi + \bar{j}\cos\varphi\end{aligned}\right\} \qquad (26)$$

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For horizontal polarization, $\bar{J}_0 = \bar{i}$, and

$$\Pi_\theta = -\sin\theta\sin\varphi$$
$$\Pi_\varphi = -\cos\varphi \qquad (27)$$

For vertical polarization $\bar{J}_0 = \bar{i}\,\frac{\sqrt{2}}{2} + \bar{k}\,\frac{\sqrt{2}}{2}$ and

$$\Pi_\theta = -\frac{\sqrt{2}}{2}\sin\theta\cos\varphi + \frac{\sqrt{2}}{2}\cos\theta$$
$$\Pi_\varphi = \frac{\sqrt{2}}{2}\sin\varphi \qquad (28)$$

With vertical polarization, the pattern in the vertical plane contains only the θ-component. In the horizontal plane ($\theta = 0$), both θ and φ-components are present. In the direction of the maximum of the system pattern ($\varphi = 0$, $\theta = 0$), the φ-component equals 0. However, a cross-polarization component E, proportional to $\sin\varphi$, is noticeable even in the main lobe, on its slopes. The horizontal φ-component of E increases with φ. At $\varphi = 90^\circ$, the vertical and horizontal com-

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ponents of the radiation become equal, which sets limits upon the magnitude of the decoupling and of the protective action in the case of an operation with perpendicular polarizations. According to experiments carried out by Kuznetsov and Sokolov (Elektrosvyaz', 1957, No. 1), the additional increase of the decoupling due to the use of two polarizations, is 10 - 20 db with periscopic antennae, as against 40 - 50 db with antennae of other types. With horizontal polarization, Π has an essential importance in the sectors of angles contiguous to $\varphi = \pm 90°$, where it is near zero and reduces the long-distance radiation. Outside these sectors, Π has but little influence on the side lobes and envelope. There are 7 figures and 8 references: 7 Soviet-bloc and 1 non-Soviet-bloc. The reference to the English-language publication reads as follows: Jakes, Theoretical study of an Antenna-Reflector Problem."Proc. IRE", 1953, vol. 41, No. 2.

SUBMITTED: January 5, 1960.

APPROVED FOR RELEASE: 06/13/2000 CIA-RDP86-00513R000722530006-6"

22892

S/109/61/006/004/006/025
E140/E163

9,1912

AUTH.: Kinber, B.Ye.

TITLE: Sidelobe radiation of reflector antennas

PERIODICAL: Radiotekhnika i eksperimenta, Vol.6, No.4, 1961, pp. 545-558

TEXT: In view of the well-known difficulties in using the approximate aperture and current-distribution methods of calculating reflector antenna radiation, the author considers the same problem from the viewpoint of the asymptotic solution of the diffraction problem. The sidelobe radiation of a reflector antenna is found in the form of a sum of "rays" satisfying the Fermat principle; the present method is a generalization of J.B. Keller's diffraction studies (Ref.1: Diffraction by aperture, J.Appl.Phys., 1957, 28, 2, 426: Ref.2: Diffraction by convex cylinder, IRE Trans 1956, AP-4, 3, 312). For reflectors of finite dimensions, in addition to Keller's rays, there are more complicated forms corresponding to combinations of multiple reflections in concave portions of the reflector, diffraction from the edges, grazing along convex portions, etc. The solution is given in an
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Sidelobe radiation of reflector ....

approximation retaining rays varying not more rapidly in amplitude with distance than $\lambda^{1/2}$. Among the present results, the author emphasizes that the effects of the reflector edge extend much further, over the entire surface of the reflector, than is usually assumed in the aperture and current approximation methods.
Acknowledgements are expressed to L.A. Vaynshteyn for discussion and advice during the writing of the article.
There are 17 figures, 2 tables and 8 references: 6 Soviet and 2 English.

SUBMITTED: May 11, 1960

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22902

9,1700

S/109/61/006/004/017/025
E140/E163

AUTHOR: Kinber, B.Ye.

TITLE: The theory of the receiving antenna

PERIODICAL: Radiotekhnika i elektronika, Vol.6, No.4, 1961, pp. 651-653

TEXT: E.L. Burshteyn (Ref.1) has derived a formula for the power received by an antenna with incidence of a non-plane wave. In the derivation it was assumed that the fraction of power scattered was much less than that received, so that the incident wave satisfies approximately the boundary conditions at the antenna surface. However, in practical problems - incidence from the direction of side-lobes, the mutual impedance of closed-spaced antennas - the scattered power exceeds the received power, and thus the initial assumptions of Burshteyn are clearly unsatisfied. The present note proves that the formula for the received power obtained by Burshteyn is rigorous and valid for arbitrary relations among the received and scattered fields.

Acknowledgements are expressed to A.A. Pistol'kors and Ya.N. Fel'd for advice.

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The theory of the receiving antenna

There are 3 Soviet references, and 1 figure.

SUBMITTED: November 10, 1960

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D204/D303

9.1800

AUTHOR: Kinber, B.Ye.

TITLE: Decoupling between closely spaced reflector antennae

PERIODICAL: Radiotekhnika i elektronika, v. 6, no. 6, 1961, 907 - 916

TEXT: The coupling coefficient η between closely spaced antennae is of great importance in SHF antennae applications. This quantity has been investigated, however, only for non-directive antennae (Ref. 1: Antenny (Antennae), Perev. s angl. pod. red. A.I. Shpuntova, Izd. Sovetskoye radio, 1951). In the present article the author analyzes the coupling between closely spaced reflector antennae, the dimensions of which are much larger than the wave length and coupling between radiators screened from each other by screens of finite dimensions. It is assumed that the antennae are mounted in such a manner that their main radiation lobes are missing each other and that the coupling between them is weak and represents a

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spurious phenomenon. The field near the aerials is determined as the sum of terms satisfying the Format principle. The common term of the sum has then the form of

$$\int_{s_1} (\vec{n}\,([\vec{j}_n\vec{\Phi}_m] - [\vec{j}_m\vec{\Phi}_n]))\,e^{ik(\psi_n+\psi_m)}\,ds. \qquad (5)$$

its amplitude is a slowly varying function and the phase has an extremum. Fig. 1 can therefore be applied to determine the integral method of stationary phase. It may be seen from Fig. 1 that extremum $\Psi_n + \Psi_m$ at S_1 corresponds to the extreme path between radiators of antennae I and II and that the section of this extreme path, linking antennae I and II, is a section of the line Q intersecting surface S_1 at p. Y. The expression for coupling between two antennae consists of a sum of terms, the phases of which are proportional to the extreme paths between the antennae. In further analysis this coupling is referred to as effected along different extreme paths. The extreme path between antenna I and II is a broken line, consisting of sections of straight lines and arcs. Every extreme path is characterized by the number of points of stationary phase of type R, H, S and T (Ref. 5: B.Ye. Kinber, Usloviye zateneniya i diffraktsionnaya popravka k raspredeleniyu toka, Radiotekhnika i elektronika, 1960, 5, 9, 1407) at both antennae. Extreme paths are possible containing not one but several common sections and corresponding not to a single but to multiple diffraction. The main types of couplings only are analyzed further in the text. Coupling O-P (coupling between the radiation); Coupling O-H-P (stationary point); Coupling O - H - P (stationary line); Coupling O-H-H-P (stationary points). There are 12 types of this coupling. Its dependence on the wave length is the same for all cases and therefore one type only is considered, namely that along the two rims of the reflectors with triple diffraction. Coupling O-H-H-P (stationary line). The comparative values parameters of various types of coupling are summarized in Table 1. Finally the author determines the order of magnitude of couplings for two antennae having diameter = 20λ and the beam width 120°. The level of illumination

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Decoupling between closely ...

of the rim of the reflector is assumed as usual to be 0.3 so that the directive gain of the radiator is 4. The level of the subsidiary lobes taken as 0.2. Same polarization of antennae is assumed and the plane of it to be in the plane of coupling. The author expresses his appreciation to A.I. Shpuntov for valuable discussions. -There are 7 figures, 2 tables and 8 references: 5 Soviet-bloc and 3 non-Soviet-bloc. The references to the English-language publications read as follows: J.B. Keller, Diffraction by an aperture, J. Appl. Phys., 1957, 28, 4, 426; E.S. Harris, Electronics, 1957, 30, 6, 204; (See Rzh Elektro-tekhnika, 1958, paper No. 30315); C.W. Hansell, Proc. I.R.E., 1945, 33, 3.

RECEIVED: August 17, 1960

Card 4/6

KINBER, B.Ye.

Diffraction of electromagnetic waves on the concave surface of a round cylinder. Radiotekh. i elektron 6 no.8:1273-1283 Ag '61. (MIRA 14:7)

(Electromagnetic waves--Diffraction)

29310
S/109/61/006/010/008/027
D201/D302

9.3700 (1057,1482)

AUTHOR: Kinber, B.Ye.

TITLE: Diffraction of electromagnetic waves at a concave spherical surface

PERIODICAL: Radiotekhnika i elektronika, v. 6, no. 10, 1961, 1652 - 1657

TEXT: In the present article, the author considers the axially symmetrical problem of diffraction of a toroidal wave at the internal surface of a sphere. To simplify the problem the radiation condition is given a priori, i.e. outside the current loop, the solution is sought in the form of a sum of normal waves "disappearing" at an angle θ with respect to the current loop. Thus, as differing from the usual determination in the spherical system of coordinates, θ varies within the interval $(-\infty, \infty)$. The values of θ, differing by $2\pi n$, correspond to different numbers of "revolution" of the wave 1, i.e. to different phase factors. The region of changes of θ is, owing to the symmetry of the problem, in the interval

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(0, π). The analysis of the Green function Γ = (R, θ, R', θ') of the problem

$$\Gamma = \frac{L}{ka}\sqrt{\frac{c}{R}}\sin\theta' \int_0 \frac{J_{\nu+\frac{1}{2}}(kR)}{J'_{\nu+\frac{1}{2}}(ka) + \frac{1}{2ka} J_{\nu+\frac{1}{2}}(ka)} \frac{\nu+\frac{1}{2}}{\nu(\nu+1)} \times \tag{15}$$

$$\times \begin{Bmatrix} L_\nu(\cos\theta) & P^1_\nu(\cos\theta') \\ P^1_\nu(\cos\theta) & L_\nu(\cos\theta') \end{Bmatrix} d\nu.$$

shows that the resulting field may be represented as the sum of multiple reflected waves, of the fields of caustics and of the field of a surface wave. The difference between the diffraction of a sphere and that at a cylinder is determined by the factor of focusing, which has a purely geometrical character at a large distance from the axis of symmetry and a diffraction character near it. The analyzed problem permits evaluation of diffraction of a boundary wave at the concave side of a mirror antenna, for which the Green function is derived as

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Diffraction of electromagnetic ...

$$\Gamma = i\frac{\sqrt[4]{\frac{\pi}{2}}}{ka}\sqrt{\frac{a\sin\theta'}{R}\frac{\theta}{\sin\theta}}\int\sqrt{\nu}J_1\left[\left(\nu+\frac{1}{2}\right)\theta\right]\times$$
$$\times\frac{J_{\nu+\frac{1}{2}}(kR)}{J'_{\nu+\frac{1}{2}}(ka)}e^{i\left[\left(\nu+\frac{1}{2}\right)\theta'+\frac{3\pi}{4}\right]}d\nu. \qquad (19)$$

In it $k = \sqrt{\omega^2\mu\varepsilon}$, a - the antenna radius and all others are symbols normally in use. There are 4 references: 3 Soviet-bloc and 1 non-Soviet-bloc.

SUBMITTED: December 1, 1960

Card 3/3

POKRAS, A.M.; KINBER, B. Ye.

Directional diagram of a periscopic system with ellipsoidal radiation. Elektrosviaz' 15 no.6:22-30 Je '61. (MIRA 14:6)
(Antennans(Electronics))

34032
S/109/62/007/001/010/027
D266/D301

9,1913

AUTHOR: Kinber, B.Ye.

TITLE: The influence of the edge of a reflector antenna on the radiation in the direction of the side-lobes

PERIODICAL: Radiotekhnika i elektronika, v. 7, no. 1, 1962, 90-98

TEXT: The paper is concerned with the side lobe radiation of some special antenna arrangements. The reflector is a paraboloid and the feed consists of two ideal (isotropic) point sources by a distance 2 l. Two cases are considered: The line connecting the point sources is (1) perpendicular to, (2) parallel with the axis of the paraboloid. The author first calculates the field strength at the edge of the reflector and then determines the radiation in the side lobes produced by a unit length of the perimeter. It is noted that this scattered power depends neither on polarization nor on the angle of incidence. Assuming further a parabolic distribution function in the aperture the proportion of power in the side lobes is given by

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The influence of the edge of a ...

$$x_1 = \frac{2}{\pi[q + \frac{1}{3}(1 - q)^2]} \left\{ \frac{1}{\mu} [q^2 + \frac{2}{3} (\frac{f \text{ arc cos } p}{r_{edge}\mu})^2] \frac{1}{2\pi} \sqrt{\frac{r_{edge}\lambda}{a^2}} q^2 \right\} \quad (21)$$

where $p = q \frac{r_{edge}}{f}$, $\mu = 5.15 - 1.3\,q$ and λ - wavelength, f - focus distance, a - radius of the reflector, q - relative value of the distribution function at the edge of the reflector, r_{edge} - distance between the focus and the edge of the reflector, x_1 - is shown as a function of q in Fig. 4 for three different values of f/r_{edge}. For $f/r_{edge} = 1$ the power in the side lobes varies between 17 % and 2.3 % whilst the edge illumination is reduced from unity to zero. The author claims that these results are in essential agreement with those calculated from the aperture distribution, from which he concludes that the effect of distant side lobes (not taken into ac= count by the aperture method) is negligible. The influence of supporting rods is also calculated in the special case when three rods

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are placed 120 degrees apart. If q = 0.3 and the relative thickness of the rods, $r_0/a = 0.01$, the proportion of power in the side lobes is 5 % for the favorable and 8 % for the unfavorable polarization. Finally, the author derives a formula for practical calculation of the antenna gain (from measured results) which takes account of the power lost in the side-lobes. There are 7 figures and 9 references: 5 Soviet-bloc and 4 non-Soviet-bloc. The reference to the English-language publication reads as follows: E.O. Willoughby, E. Heider, IRE, Trans., 1960, AP-7, 2, 201.

SUBMITTED: February 20, 1961

39463

S/109/62/007/003/005/029
D234/D302

9.2572 (1059)

AUTHORS: Gertsenshteyn, M.Ye., and Kinber, B.Ye

TITLE: Stability of the super-regenerative regime of an amplifier with complex networks

PERIODICAL: Radiotekhnika i elektronika, v. 7, no. 3, 1962, 397 - 403

TEXT: The authors formulate equations for a parametric amplifier with variable capacity without frequency transformation, considering it as an n-terminal network. For the case of a two-circuit non-degenerate regenerative amplifier, an equation of Hill's type is deduced from the general equations; the stability of the solutions is determined by that of the solutions of the corresponding homogeneous equation. It is found that if a complicated input filter is used, whose band is not much wider than that of the amplifier, the domains of stability depend essentially on the parameters of superization. The case of an input filter consisting of two equal links is considered as an example; the homogeneous equation is reduced

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to a Mathieu form and its stability diagram is discussed. For a special case of stability the authors refer to P.L. Kapitza (Ref. 11: ZhETF 1951, 21, 5, 588). There are 1 figure and 11 references: 8 Soviet-bloc and 3 non-Soviet-bloc. The references to the English language publications read as follows: H. Rowe, Proc. IRE, 1958, 46 5, 850; R.G. Smart, Proc. IRE, 1961, 49, 6, 1051.

SUBMITTED: July 27, 1961

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38464
S/109/62/007/006/009/024
D266/D308

9,1911

AUTHOR: Kinber, B. Ye.

TITLE: Two-reflector antennas

PERIODICAL: Radiotekhnika i elektronika, v. 7, no. 6, 1962, 973-980

TEXT: A theoretical study of the performance of antennas having two separate reflectors. The mathematical formulation of the problem is as follows: How to choose the surfaces of reflectors I and II to transform the wavefront

$$z_1 = z_1(x_1, y_1) \quad (1)$$

and amplitude distribution $A_1 = A_1(x_1, y_1)$ (2)

into the wavefront $z_2 = z_2(x_2, y_2)$ (3)

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and amplitude distribution $A_2 = A_2(x_2, y_2)$ (4)

Assuming geometrical optics and taking account of the conservation of energy differential equations are obtained both for the paths of the rays and for the surface of the reflectors. It is shown that in the general three-dimensional case a solution does not necessarily exist. As an example an axially symmetrical system is presented where the spherical wavefront of a feed is transformed into a plane wavefront with the aid of two reflectors. The radiation pattern of the feed is taken as

$$T(\psi) = \cos \frac{\pi}{2} \frac{\psi}{\psi^*} \tag{26}$$

where $2\psi^*$ is the angle between the zero points of the radiation pattern. It is shown that the gain achievable by the optimally

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designed two-reflector system is about 25 - 40% larger than that of an ordinary paraboloid antenna. The optima are very near to the Cassegrain system where the small reflector is a hyperboloid and the large reflector a paraboloid. The efficiency of the illumination, μ, is plotted against γ - the angle of illumination for the small reflector. Under optimum conditions the illumination at the edge of the small reflector is about 8 - 12 db down. There are 6 figures and 2 tables.

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SUBMITTED: July 26, 1961

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KINBER, B.Ye.

Diffraction of cylindrical waves on a halfplane. Radiotekh. i elektron 7 no.7:1247-1248 '62. (MIRA 15:6)
(Optics, Geometrical)
(Electromagnetic waves--Diffraction)

42118

S/109/62/007/010/005/012
D266/D308

AUTHOR: Kinber, B.Ye.

TITLE: Diffraction at the open end of a sectoral horn

PERIODICAL: Radiotekhnika i elektronika, v. 7, no. 10, 1962, 1749 - 1762

TEXT: The author considers the most general type of horn with walls of unequal length and flanges. It is assumed that the horn is fed through a matched transmission line which does not disturb the geometry of the horn. The author solves first the equation of propagation of electromagnetic waves in an infinitely long horn. The solution is obtained in terms of Hankel functions. The field in the infinite horn can also be expressed as a sum of rays reflected by perfect walls. This picture breaks down for the finite horn because of the edge effects. The edge of the horn behaves in the same way as a semi-infinite plane for an incident field. The solution of this diffraction problem consists of a transmitted wave, of a reflected wave and of an edge wave. In the present case part of the edge wave is reflected again in the horn and gives rise to a new edge wave. The

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total field can be obtained by superposing all edge waves and taking account of all the reflections. This leads to infinite sums but in actual calculations it is sufficient to take only a few terms into account. The reflection caused by the edges is calculated by determining first the magnitude of the edge waves and then calculating the component in the direction of the throat. Coupling between horns can be determined similarly by calculating the edge waves on the second horn. The radiation pattern of an ordinary horn is calculated up to second order accurary. There is a discontinuity at the border of the shadow region, due to the finite order of accuracy; the continuity of the solution is ensured by the higher order terms. The author concludes that the usual radiation pattern obtained with the aid of Kirchhoff approximation has an error of the order of $(kl)^{-1/2}$. Experiments do not bear out this surmise for the reason that most of the rays which would contribute to the main lobe are absorbed by the waveguide adjoining the horn. There are 10 figures.

SUBMITTED: August 1, 1961

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POKRAS, Aleksandr Mikhaylovich. Prinimal uchastiye KINBER, B.Ye.,; ZINʹKOVSKIY, A.I., otv. red.; VOLKOVA, E.M., red.; ROMANOVA, S.F., tekhn. red.

[Periscopic antennas and beam transmission lines] Periskopicheskie anteny i besprovodnye linii peredachi. Moskva, Sviaz'izdat, 1963. 197 p. (MIRA 16:7)
(Microwave communication systems)
(Antennas (Electronics))

L 12899-63 EWT(1)/EEC(b)-2/BDS AFFTC/ASD/ESD-3/RADC Pi-4/Pj-4
ACCESSION NR: AP3003715 S/0109/63/008/007/1145/1155

65

AUTHOR: Gertsenshteyn, M. Ye.; Kinber, B. Ye. [redacted]

TITLE: On the theory of regenerative systems with random pumping

SOURCE: Radiotekhnika i elektronika, v. 8, no. 7, 1963, 1145-1155

TOPIC TAGS: regenerative system, random pumping, parametric amplifier, regenerative parametric amplifier

ABSTRACT: Equations for constant and variable components of an amplified signal are derived for the case of an arbitrary pumping correlation and a sinusoidal input signal. A general method for solving these equations is given. Formulas for the regular and random component at the output of a regenerative paramagnetic amplifier, as well as expressions for multiplications of two, four, and six random functions, are obtained. These data are derived for two-frequency amplifier circuits without conversion, but they can be easily adapted to other parametric and quantum molecular amplifiers. The proposed methods make it possible to calculate the response of an amplifier to a sinusoidal signal and its statistical characteristics at any width of the pumping frequency spectrum. The presence of a random component results in a loss of information while the signal passes through

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the amplifier, but this loss may be sharply reduced by correct selection of the modulation method and the elements following the amplifier. Orig. art. has: 52 formulas.

ASSOCIATION: none

SUBMITTED: 24Dec62 DATE ACQ: 02Aug63 ENCL: 00

SUB CODE: GE, MM NO REF SOV: 010 OTHER: 002

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KINBER, B.Ye.

Theory of plane horns with round edges. Radiotekh. i elektron. 8 no.12:2078-2082 D '63. (MIRA 16:12)

L 24928-65 EEC-4/EEC(k)-2/EWT(l) Po-4/Pe-4/Pl-4/Po-4/Pq-4
ACCESSION NR: AP4045880 S/0109/64/009/009/1581/1593

48
B

AUTHOR: Kinber, B. Ye.; Tseytlin, V. B.

TITLE: Error in measuring the directive gain and directional pattern of antennas at close range

SOURCE: Radiotekhnika i elektronika, v. 9, no. 9, 1964, 1581-1593

TOPIC TAGS: antenna, antenna pattern, antenna pattern measurement

ABSTRACT: The conventional formula $\eta = P_r/P_t = (\lambda/4\pi R)^2 G_t G_r$ (where P_t is the transmitting-antenna power, P_r is the receiving-antenna power, R is the distance between the antennas, G_t and G_r are the directive gains of the antennas) is true only if we assume that the wave arriving at the receiving antenna is planar and constant in its amplitude. However, in antenna measurements, the arriving wave is not planar and is directional. To introduce a correction, the above formula is regarded as the first term of an asymtotic development η into the

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